TECHNICAL SCHEDULE V

ELECTRICAL WORKS

(To be completed by the Tenderer)

5.1 High Voltage Metal Enclosed Switchboards

Sr. No.	Description	Unit	Technical Particulars
5.1.1	Make		
5.1.25	Type		
5.1.35	Applicable Standards		
5.1.45	Quantity	No.	
5.1.55	Dimensions	mm x mm x mm	
5.1.65	Switchgear cubicles and Bus bar ratings		
(a)	Rated voltage, phases and frequency		
(b)	System Neutral Earthing		
(c)	Maximum system voltage	kV	
(d)	One minute power frequency withstand voltage	kV (rms)	
(e)	12/50 μsec impulse withstand voltage	kV (peak)	
(f)	Short circuit withstand		
	(i) Short time (1 sec) at rated voltage	kA(rms)	
	(ii) Dynamic rating	kA (peak)	

Sr. No.	Description		Unit	Technical Particulars
(g)	Reference ambient temperature			
(h)	Maximum temperature of bus bars droppers connectors and contacts at continuous current rating under site reference ambient temperature			
(i)	Continuous current rating of bus bar		A	
(j)	Bus bar material			
(k)	Bus bar Insulation			
(l)	Cable entry			
(m)	Cable type for Incoming and Outgoing feeders			
5.1.7	**Switchgear constructional Requirement**			
(a)	Thickness of sheet steel Frame, Frame enclosures, doors, covers and partitions		mm	
(b)	Degree of protection			
(c)	Colour finish shade			
(d)	Earthing bus	i) Material		
		ii) Size	mm x mm	
(e)	Earthing conductor	i) Material		
		ii) Size	mm x mm	

Sr. No.	Description	Unit	Technical Particulars
5.1.85	**Breaker Particulars**		
(a)	Circuit breaker type		
(b)	Voltage, phases and frequency		
(c)	Rated operating duty		
(d)	Rated current at reference ambient temperature (i) Incoming breakers	A	
	(ii) Outgoing breakers	A	
(e)	Rated breaking capacity	kA (rms)	
(f)	Rated making current	kA (peak)	
(g)	Short time current withstand for 1 sec duration	kA (rms)	
(h)	Total break time		
(i)	Operating mechanism type (Normal)		
	Operating mechanism type (Emergency)		
(j)	Minimum no. of auxiliary contacts		
(k)	Withstand test voltage		
	(i) One minute power frequency	kV (rms)	
	(ii) 1.2/50 μ sec impulse	kV (peak)	
(l)	Auxiliary control voltage (i) For closing / tripping coil		

Sr. No.	Description	Unit	Technical Particulars
	(ii) For spring charging motor		
	(iii) For space heaters and lighting		
(m)	Anti pumping feature		
(n)	Latching requirement		
5.1.95	**Current Transformers**		
(a)	Type		
(b)	Class of insulation		
(c)	Rated current ratio and burden (i) Incomers and bus couplers		
	(ii) Outgoing feeders		
(d)	Accuracy class (i) Metering		
	(ii) Protection		
(e)	Short time 1 sec current rating	kA (rms)	
(f)	Dynamic rating	kA (peak)	
5.1.10	**Voltage Transformers**		
(a)	Type		
(b)	Rated Voltage (i) Primary	V	
	(ii) Secondary – S1	V	

Sr. No.	Description	Unit	Technical Particulars
(c)	Method of connection (i) Primary – P		
	(ii) Secondary – S1		
(d)	Application – S1		
(e)	Rated burden	VA	
(f)	Accuracy class		
(g)	Rated voltage factor (i) Continuous		
	(ii) Short time		
(h)	Insulation class		
5.1.115	**Meters**		
(a)	Make		
(b)	Accuracy Class		
	(i) Indicating Meters		
	(ii) Energy Meter		
5.1.125	**Protective Relays**		
	Type		
	Auxiliary supply		
5.1.155	Annunciations Provided for 11kV Metal enclosed Switch board		
a	At STP substation		
b	At ISPS Substation		

Sr. No.	Description	Unit	Technical Particulars
c	AT Air Blower Bldg		
d	At DG Switchgear at substation near DG room		
e	At Switchgear at substation near Bio-Gas ancillary room		
5.1.165	Whether Cubicle Components Provided as per Part 12 - Particular Electrical Requirement of Specification	Yes / No	
5.1.175	Auxiliary A.C. Supply Voltage & Frequency	V, Hz	
5.1.185	Whether all the above details attached for all Switchgear cubicles at locations mentioned as per 5.1.13	Yes /No	

5.2 Distribution Transformers

5.2.1	Manufacturer		
5.2.25	Full load rating	KVA	
5.2.35	Number of Phases	One/ Three	
5.2.4	Rated no-load voltage		
	a) HV	KV	
	b) LV	KV	
5.2.55	Type of Cooling		
5.2.65	Rated percentage impedance	%	
5.2.7	Winding connections		

	a) HV		
	b) LV		
	c) Vector group		
5.2.8	Tapping on winding		
	a) On load/off load tap		
	b) Total tapping range	%	
	c) Tapping steps		
	d) On HV/LV windings		
5.2.9	Maximum temperature rise of		
	a) Oil by thermometer	^{0} C	
	b) Windings by resistance method	^{0} C	
5.2.10	Load loss at rated current at 75^{0}C winding temperature (guaranteed, subject to + tolerance as per applicable standard)	KW	
5.2.11	No-load losses (core loss and dielectric loss) at 100% rated voltage and frequency, subject to + tolerance as per applicable standard	KW	
5.2.12	Magnetization current at rated voltage and frequency in percent of full load current	%	
5.2.13	Weight		
5.2.13.1	Windings	Kg	
5.2.13.2	Core	Kg	
5.2.13.3	Oil	Kg	
5.2.13.4	Tank, coolers & fittings	Kg	

5.2.13.5	Total (5.2.13.1 TO 5.2.13.4)	Kg	
5.2.14	Efficiency at 75^0C Full Load, U.P.F.	%	
5.2.15	Maximum Flux Density		
5.2.15.1	At rated voltage	Wb/m^2	
5.2.15.2	At 110% of rated voltage	Wb/m^2	
5.2.16	Drawing number of the general outline drawing enclosed with the bid, showing the transformer with all its fittings and accessories in plan, front and side elevations and other relevant details.		

5.3 Metal Enclosed Switchgears PCC/MCC/LT Panel

Sr. No	Description	Unit	Technical Particulars
5.3.1	**Make**		
5.3.2	**415 V Switchgear And Busbar Ratings**		
(a)	Rated voltage phase and frequency		
(b)	System Neutral Earthing		
(c)	Maximum system voltage	V	
(d)	One minute power frequency voltage		
	i) Power circuits	V	
	ii) Control circuits	V	
	iii) Aux. Circuits connected to Sec of CTS	V	
(e)	Continuous current rating of Busbars under site reference Ambient Temperature and type & material	Rating Material	
(f)	Busbar insulation		
(g)	Reference Ambient	° C	

Sr. No	Description		Unit	Technical Particulars
	Temperature			
(h)	Maximum Temperature of Busbars, Droppers and Contacts at Continuous current rating under site ambient temperature		° C	
(i)	Short Circuit current withstand for Busbars and droppers (i) Short time 1 sec		kA (RMS)	
	(ii) Dynamic Rating		kA (Peak)	
5.3.3	**Switchgear Constructional Requirement**			
(a)	Type of Construction			
(b)	Thickness of sheet steel (i) Frame, Frame enclosures, doors, covers and partitions		mm	
(c)	Degree of protection			
(d)	Colour finish shade			
(e)	Earthing bus	Material		
		Size	mm x mm	
	Earthing conductor	Material		
		Size	mm x mm	
(g)	Minimum clearances in air of live parts (i) Phase to Phase		mm	
	(ii) Phase to Earth		mm	
(h)	Cable entry to cubicles			
5.3.4	**Instrumentation Transformers**			
(a)	Current transformer			
	(i) Ratio			
	(ii) Burden		VA	
	(iii) Accuracy Class			

Sr. No	Description	Unit	Technical Particulars
(b)	Voltage transformer		
	(i) Ratio		
	(ii) Burden	VA	
	(iii) Accuracy Class		
5.3.5	Whether all the above details attached for all Switchgear cubicles at Process Air Blower Building	Yes /No	

5.4 415 V Power Capacitor and Control Panel

Sr. No	Description		Unit	Technical Particulars
5.4.1	**General**			
(a)	Make			
(b)	Rated Capacity		KVAR	
(c)	Rated voltage		V	
(d)	Rated frequency and phases			
(e)	Ambient temperature		° C	
(f)	Cable gland required			
(g)	Type of cable			
(h)	Size of cable			
(i)	Cable entry			
5.4.2	**Constructional Requirement**			
(a)	Thickness of sheet steel i) Frame, Frame enclosures, doors covers and partition		Mm	
(b)	Degree of protection			
(c)	Colour finish shade			
(d)	Earthing bus	Material		
		Size	mm x mm	
(e)	Earthing conductor	Material		
		Size	mm x	

Sr. No	Description	Unit	Technical Particulars
		mm	
5.4.3	**Design Requirement**		
(a)	Insulation level	kV (rms)	
(b)	Capacitor bank connection		
(c)	Short circuit withstand for busbars i) Short time (1 sec)	kA (rms)	
	ii) Dynamic	kA (peak)	
(d)	Type of switching		
(e)	Switching steps		
(f)	Switch and Rating of contactor		
(g)	Incomer MCCB current rating		
(h)	O/L capacity of capacitors		
(i)	O/V capacity of capacitors		
(j)	Protections		

5.5 Diesel Standby Generator Sets

	Sr. No.	Description	Unit	Technical Particulars
	5.5.1	**General**		
(a)		Set Manufacturer		
(b)		Quantity & Type		
(c)		Applicable Standard		
(d)		Rating		
(e)		Provision of AMF Control Panel	Yes/ No	
(f)		Provision of Synchronising Panel	Yes/ No	
	5.5.2	**Alternator**		
(a)		Manufacturer		

	Sr. No.	Description	Unit	Technical Particulars
(b)		Type		
(c)		Applicable Standard		
(d)		Rating	KVA	
(e)		Voltage	V	
(f)		Number of phases		
(g)		Frequency	Hz	
(h)		Power Factor		
(i)		Rated Current	A	
(j)		Overload Capacity		
(k)		Class of Insulation		
(l)		Degree of protection		
(m)		Winding Connection		
(n)		Short circuit current		
(o)		Type of rotor bearings		
(q)		Provision of temperature sensors in stator windings		
(r)		Exciter		
(i)		Make		
(ii)		Type		
(iii)		Applicable Standard		
(s)		AVR		
(i)		Make		
(ii)		Type		

	Sr. No.	Description	Unit	Technical Particulars
(iii)		Applicable Standard		
(t)		Voltage regulation		
(u)		Outgoing Cable		
(i)		Make		
(ii)		Type		
(iii)		Applicable Standard		
(iv)		Size		
	5.5.3	**Diesel Engine**		
(a)		Manufacturer		
(b)		Type		
(c)		Applicable Standard		
(d)		Rating	HP	
(e)		Speed	RPM	
(f)		Number of Cylinders		
(g)		Number of Strokes		
(h)		Type of Starting		
(i)		Duty		
(j)		Overload Capacity		
(k)		Radiator		
		(i) Make		
		(ii) Type		
		(iii) Fan power		
		(iv) Cooling air flow		

	Sr. No.	Description	Unit	Technical Particulars
(l)		Exhaust system		
		(i) Type of Silencer		
		(ii) Exhaust temperature gauge range		
(m)		Governor		
		(i) Make		
		(ii) Type		
		(iii) Applicable Standard		
		(iv) Class of governor		
(n)		Cooling Water System		
		(i) Water temperature		
		(ii) Water Pressure		
		(iii) System Capacity		
		(iv) Provision of High water temperature and low water level switches		
(o)		Lubricating oil system		
(i)		Grade of Oil		
(ii)		Oil Pressure		
(iii)		Oil temperature		
(iv)		Sump Capacity		
(v)		Oil Consumption per 100 hours		
(vi)		Recommended time period of Oil Change		

	Sr. No.	Description	Unit	Technical Particulars
(p)		Fuel		
(i)		Fuel Specification		
(ii)		Fuel Consumption at rated Capacity		
(q)		Day oil tank		
(i)		Capacity	Litres	
(ii)		Provision of Level Gauge		
(r)		Bulk Storage tank		
(i)		Location		
(ii)		Type		
(iii)		Capacity		
5.5.4		**AMF Control Panel**		
(i)		Make		
(ii)		Type		
(iii)		Applicable Standard		
(iv)		Constructional Features		
(a)		Thickness of sheet steel Frame, Frame enclosures, doors covers and partition	mm	
(b)		Colour finish shade - Interior		
(c)		Colour finish shade - Exterior		
(d)		Degree of Protection		
(v)		AMF Features Provided as per Technical Specification	Yes/No	

	Sr. No.	Description	Unit	Technical Particulars
5.5.5		Protections, Alarm, Indications & Control whether provided as per Specification	Yes/No	
5.5.6		Synchronising Panel		
(i)		Make		
(ii)		Type		
(iii)		Applicable Standard		
(iv)		Constructional Features		
(a)		Thickness of sheet steel Frame, Frame enclosures, doors covers and partition	mm	
(b)		Colour finish shade - Interior		
(c)		Colour finish shade - Exterior		
(d)		Degree of Protection		
(v)		Synchroscope		
(a)		Make		
(b)		Type		
(c)		Applicable Standard		
5.5.7		Acoustic Enclosure		
(i)		Make		
(ii)		Type		
(iii)		Applicable Standard		
(iv)		Constructional Features		
(a)		Thickness of sheet steel		

	Sr. No.	Description	Unit	Technical Particulars
		Frame, Frame enclosures, doors covers.	mm	
(b)		Degree of Protection		
(c)		Acoustic material		
(iv)		Sound level at 1m distance		
(v)		Whether certified to meet emission norms	Yes/No	
5.5.8		Battery		
(i)		Make		
(ii)		Type		
(iii)		Applicable Standard		
(iv)		Voltage		
(v)		Capacity at 10 hours rate		
(vi)		Number of successive starting permissible		
5.5.9		Battery Charger		
(i)		Make		
(ii)		Type		
(iii)		Applicable Standard		
(iv)		AC Input to Charger		
(v)		DC Output of Charger		

5.6 Variable Frequency Drives

Sr. No.	Description	Unit	Technical Particulars
5.6.1	**General**		
(a)	Make		
(b)	Type		
(c)	Applicable Standard		
(d)	Drive Application		
(e)	Quantity	Nos.	
(f)	Type of converters		
(g)	Inverter capacity at specified pf		
(h)	Rated Current		
(i)	Load power factor		
(j)	Max. continuous current		
(k)	Rated voltage with number of phases		
(m)	Rated frequency		
(n)	Converter Bridge		
(o)	Single Quadrant/Two quadrant/ Four Quadrant		
5.6.2	Control Characteristics		
(a)	Speed Control		
(b)	Rated speed		
(c)	Speed ratio		
(d)	Constant torque/constant power		
(e)	Speed accuracy		
(f)	Closed loop/open loop		
(g)	Accel./ Deccel. time		
(h)	Possibility of Remote Operation	Yes / No	
5.6.3	Overall Harmonic Limitation	%	
5.6.4	Braking		
(a)	Type of braking		
(b)	Braking Torque		
5.6.5	Miscellaneous		

Sr. No.	Description	Unit	Technical Particulars
(a)	Soft-start	Yes/No	
(b)	Flying restart	Yes/No	
(c)	Auto restart	Yes/No	
(d)	Kinetic Buffering	Yes/No	
5.6.6	Confirm whether following minimum Indications on Drive Panel are Provided	Yes/No	
(a)	Motor running		
(b)	Motor stopped / trip		
(c)	AC mains 'ON'		
(d)	System Ready to start		
(e)	VFD system fault		
5.6.7	Confirm whether Digital Display of following Minimum parameters on the Drive Panels:-	Yes/No	
(a)	Input AC Voltage		
(b)	Input AC Frequency		
(c)	Input AC Current		
(d)	Output Voltage		
(e)	Output Current VFD/Bypass		
(f)	Output Frequency		
(g)	Motor speed		
(h)	Whether Necessary transducers provided for indicating motor speed & current in PLC/DCS.	Yes/No	

5.7 Battery

Sr. No.	Description	Unit	Technical Particulars

5.7.1	Make		
5.7.2	Type of battery		
5.7.3	Applicable Standards		
5.7.4	Number of battery banks required		
5.7.5	Ambient conditions		
5.7.6	D.C. system voltage	V	
5.7.7	Ampere hour capacity of battery at 27 Deg. C at 5 hour rate to give final cell voltage of 1.16 volts/cell	Ah	
5.7.8	Momentary load/duration	A	
5.7.9	Emergency load/duration	A	
5.7.10	Continuous load/duration	A	
5.7.11	Nominal voltage	V	
5.7.12	Cell voltage - initial/final	V	
5.7.13	Number of cells per bank required to give rated voltage	Nos.	
5.7.14	Number of spare cells per bank	Nos.	
5.7.15	Overall dimensions		
a	Each Cell (L x W x H)	mm x mm x mm	

b	Complete battery in the rack	mm x mm x mm	
5.7.16	Mounting arrangement		
5.7.17	Charging method		

5.8 Battery Charger

Sr. No.	Description	Unit	Technical Particulars
5.8.1	**General**		
(a)	Make		
(b)	Applicable Standards		
(c)	Number required (i) Battery charger	 Nos	
(d)	Rated Output voltage (DC)	V	
(e)	Rated Output	kW	
(f)	DC System Earthing		
(g)	Voltage regulation from no load to rated load	%	
(h)	Ambient Design Temperature	Deg. C	
(i)	Busbar material & size	-	
(j)	Overall dimensions	mm x mm x mm	
5.8.2	**Battery Details**		
(a)	Float/Trickle charging current of battery	mA	
(b)	Boost Charging Current of Battery (Maximum)	A	
(c)	Boost Charging Voltage of Battery (maximum)	V	
(d)	Maximum Time for Boost charging of Battery	hr	
(e)	Battery capacity & no. of cells	Ah	

Sr. No.	Description		Unit	Technical Particulars
			Nos.	
5.8.3	**AC System Data**			
(a)	Supply	Voltage	V	
		Phase		
(b)	(i) Variation in supply Voltage		%	
	(ii) Variation in supply frequency		%	
(c)	Short Circuit level		kA	
(d)	Type of earthing			
5.8.4	**Performance**			
(a)	DC voltage setting adjustment for float charger			
(b)	Voltage stabilisation for constant voltage regulator			
(c)	Maximum permissible variation in DC voltage (no load to full load)			
(d)	D.C. voltage setting adjustment for boost charging			
(e)	D.C. current adjustment for boost Charging			
(f)	Current stabilisation for constant current regulator for boost charger			
(g)	Minimum permissible power factor to rated continuous load			
(h)	Permissible ripple content at rated continuous load			

Sr. No.	Description		Unit	Technical Particulars
(i)	Relay for auto changeover from Float to boost mode to be provided (in case of float-cum-boost charger)			
5.8.5	**Constructional Features**			
(a)	Thickness of sheet steel Frame, Frame enclosures, doors, covers and partition		mm	
(b)	Degree of protection			
(c)	Colour finish shade			
(d)	Earthing bus	Material		
		Size	mm x mm	
(e)	Earthing conductor	Material		
		Size	mm x mm	
(f)	Cable entry			
(g)	Cable Sizes (i) Battery		sq.mm	
	(ii) DC output		sq.mm	
	(iii) AC input		sq.mm	

5.9 DC Distribution Board

Sr. No.	Description	Unit	Technical Particulars
5.9.1	**General**		
(a)	Make		
(b)	Applicable standards		
(c)	DC System voltage (Nominal)	V	
5.9.2	DC System Earthing		
5.9.3	Ambient Design Temperature	Deg. C	
5.9.4	Bus bar material , rating and size		

5.9.5	**DC Bus Load**		
(a)	Total continuous DC load	A	
(b)	Short time loads (Additional to continuous loads)		
	(i) DC lights/Facia lamps	A	
	(ii) Starting current and duration of Largest Connected DC Motor	A	
		Secs	

5.9.6	**Constructional Features**		
(a)	Thickness of sheet steel Frame, Frame enclosures, doors, covers and partition		mm
(b)	Degree of protection		
(c)	Colour finish shade		
(d)	Earthing bus	Material	
		Size	mm x mm
(e)	Earthing conductor	Material	
		Size	mm x mm
(f)	Cable entry		
(g)	Cable Sizes		
	(i) DC Input from Battery		sq.mm
	(ii) DC output to Load		sq.mm

5.10 Non Segregated Bus Duct

Sr. No.	Description	Unit	Technical Particulars
5.10.1	Type of Bus Duct		
5.10.2	Type of Cooling		
5.10.3	Installation		
5.10.4	Nominal Service Voltage	V	

Sr. No.	Description	Unit	Technical Particulars
5.10.5	Rated Voltage Class	V	
5.10.6	Continuous Current Rating of Bus Ducts under Site Conditions	A	
5.10.7	One minute Power Frequency Withstand Voltage	V	
5.10.8	Momentary Current Rating	kA	
5.10.9	Short Time Current Rating for one second - kA (RMS)	kA	
5.10.10	Maximum Temperature (Hot Spot) of Busbars at Rated Current - ˚C		
5.10.11	Maximum Temperature (Hot Spot) of Enclosure at Rated Current ˚C		
5.10.12	Busbar Material		
5.10.13	Busbar Section		
5.10.14	Bus Enclosure Material		
5.10.15	Shape of Enclosure		
5.10.16	Phase Clearance (Minimum) Phase to Phase Phase to Earth	 mm mm	
5.10.17	Type of Joints between Adjacent Sections of Bus Conductor Welded/Bolted		

5.11 Cable

Sr. No.	Description	Unit	Technical Particulars
5.11.1	**11kV (UE) XLPE Insulated Power Cables**		
(a)	Make		

Sr. No.	Description	Unit	Technical Particulars
(b)	Type		
(c)	Applicable Standards		
(d)	Cable size selection whether done as per Specification	Yes /No	
(e)	Continuous current rating with cable laid in air/ground under specified ambient temperature	A	
(f)	Conductor material		
(g)	Conductor screening		
(h)	Insulation		
(i)	Screening on Insulation		
(j)	Identification of codes		
(k)	Inner sheath		
(l)	Filler material		
(m)	Armouring		
(n)	Outer sheath		
(o)	Overall diameter of the cable	mm	
(p)	Recommended minimum bending radius	mm	
(q)	Standard length of cable on each drum	mts	
5.11.2	**1100 V Grade XLPE Insulated Power Cables**		
(a)	Make		
(b)	Type		
(c)	Applicable Standards		
(d)	Cable size selection whether done as per Specification	Yes /No	
(e)	Conductor material		
(f)	Insulation		

Sr. No.	Description	Unit	Technical Particulars
(g)	Inner sheath		
(h)	Armouring		
(i)	Outer sheath		
(j)	Overall diameter of cable		
(k)	Recommended minimum bending radius	mm	
(l)	Standard length of cable on each drum	mts	
5.11.3	**1100 V Grade PVC Insulated Power Cables**		
(a)	Make		
(b)	Type		
(c)	Applicable Standards		
(d)	Cable size selection whether done as per Specification	Yes /No	
(e)	Recommended minimum bending radius	mm	
(f)	Standard length of cable on each drum	mts	
5.11.4	**650/1100 V Grade PVC Insulated Control Cables**		
(a)	Make		
(b)	Type		
(c)	Applicable Standards		
(d)	Rated voltage		
(e)	Cable size selection		
(f)	Conductor material		
(g)	Insulation		
(h)	Inner sheath		
(i)	Armouring		

Sr. No.	Description	Unit	Technical Particulars
(j)	Outer sheath		
(k)	Standard length of cable on each drum	mts	

5.12 Lighting Fixtures and Accessories

Sr. No.	Description	Unit	Technical Particulars
5.12.1	**General**		
(a)	Illumination levels at various premises whether considered as per Specification	Yes /No	
(d)	Normal supply voltage, phase and frequency	AC	
		DC	
(e)	Variation in supply:		
	(i) Voltage (AC & DC)	%	
	(ii) Frequency	%	
	(iii) Combined voltage & frequency	%	
(f)	Design ambient air temperature	^{0}C	
5.12.2	Luminaire terminal suitable for		
(a)	Indoor area		
	(i) Conductor material		
	(ii) Cable size	Cores x mm^2	
(b)	Outdoor area		
	(i) Conductor material		
	(ii) Cable size	Cores xmm^2	
5.12.3	Luminaire earthing terminal suitable for		
	(i) Conductor material		
	(ii) Conductor size	SWG	

Sr. No.	Description	Unit	Technical Particulars
5.12.4	Luminaires		
(i)	Fluorescent Luminaires		
(a)	Make		
(b)	Type		
(c)	Rating		
(ii)	HPSV Luminaires		
(a)	Make		
(b)	Type		
(c)	Rating		
(iii)	Flood Light Luminaires		
(a)	Make		
(b)	Type		
(c)	Rating		

5.13 Lighting System and Equipment

Sr. No.	Description	Unit	Technical Particulars
5.13.1	**System Particular**		
(a)	**Voltage**		
	(i) 3 Phase, 4 wire 50 Hz system		
	• Rated	V	
	• Maximum	V	
	• One minute withstand voltage		
	(ii) D.C. system		
	• Rated	V	
(b)	System short-circuit level		
	(i) At 415 V, A.C.	kA	

Sr. No.	Description	Unit	Technical Particulars
		(RMS)	
	(ii) At 110 V.D.C.	kA (D.C.)	
(c)	Reference ambient temperature	^{0} C	
5.13.2	**Distribution Board/Panels**		
(a)	Main, floor mounted distribution boards		
(i)	Main Lighting distribution board(A.C.)		
	• Make		
	• Type		
	• Degree of protection		
	• Bus bar material		
	• Bus bar current rating	A	
	• Short circuit current rating	kA	
	• Details of Incoming and Outgoing feeders		
	• Cable entry		
	• Location		
(ii)	Emergency lighting panel (D.C.)		
	• Make		
	• Type		
	• Degree of protection		
	• Bus bar material		
	• Bus bar current rating	A	
	• Short circuit current rating	kA	
	• Details of Incoming and Outgoing feeders		
	• Cable entry		
	• Location		

Sr. No.	Description	Unit	Technical Particulars
(iii)	Single phase Lighting DBs (SLDBs), Three Phase lighting DBs (TLDBs) / Wall/ Structure mounting		
	SLDB/TLDB for indoor area		
	• Make		
	• Type		
	• Details of Incoming and Outgoing feeders		
	• Degree of Protection		
(iv)	SLDB/TLDB for outdoor area		
	• Make		
	• Type		
	• Details of Incoming and Outgoing feeders		
	• Degree of Protection		
(v)	Paint Finish		
	(i) Colour shade:		
5.13.3 (a)	**Street Light Poles And Flood Light Poles** Street Light Pole		
	Type		
	Total Height:	MTRS	
	Quantity:	Nos.	
(b)	Floodlight Light Pole		
	Type		
	Total height :	MTRS	
	Quantity:	Nos.	
	No. Of floodlights to be fixed per pole	No.	

5.14 Earthing and Lightning Protection System

Sr. No.	Description	Technical Particulars		
		Size	**Material**	**No. of Leads & Quantity**
5.14.1 (a)	**Main Earthing Grid** Buried in earth			
(b)	Buried in floor slabs in buildings			
5.14.2	**Conductor Leads To Equipment** (above ground)			
(a)	Transformers			
(i)	Transformer neutral to bottom of tank			
(ii)	From bottom of tank to earth grid			
(iii)	Transformer tanks and radiator bank			
(b)	Diesel Generator Set			
(i)	DG Set neutral earthing			
(ii)	DG Set body earthing			
(c)	Fence posts and gates (Flex. braid)			
5.14.3	11kV Metal Enclosed Switchboard, 415V switchgear/ MCC.			
5.14.4	Motors			
(a)	415V Motors above 10 kW			
(b)	415V Motors up to 10 kW			

Sr. No.	Description	Technical Particulars		
(c)	Fractional horse power motors			
5.14.5	**Other Items**			
(a)	Capacitor panel, Battery charger panel, DC distribution board , Main lighting D.B, Control panels and sub-lighting distribution boards etc			
(b)	Hand Rails			
(c)	Cable trays			
(d)	Tanks			
(e)	Junction boxes			
(f)	Lighting fixtures, receptacles, lighting conduits			
(g)	Push button stations, limit switches			
5.14.6	**Crane rail**			
5.14.7	Street lighting, flood lighting poles and junctions boxes			
5.14.8	Metallic noncurrent carrying structures			
5.14.9	**Lightning Conductors**			
(a)	Lightning protection down comers for building			
(b)	Lightning protection horizontal roof conductor for building			
5.14.10	**Electrodes**			
(a)	Pipe electrode			